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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,727	11/14/2003	Jennifer Ellen McCusker-Orth	71556 US02	2705

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EXAMINER

WITHERSPOON, SIKARL A

ART UNIT	PAPER NUMBER
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1621

DATE MAILED: 08/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/713,727	<b>Applicant(s)</b> MCCUSKER-ORTH ET AL.	
	<b>Examiner</b> Sikarl A. Witherspoon	<b>Art Unit</b> 1621	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 November 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-80 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,5-7,9-21,23-31,34,35,37-42,44-48,51,52,54-59,61-65,68,69 and 71-80 is/are rejected.
- 7) ☒ Claim(s) 2-4,8,22,32,33,36,43,49,50,53,60,66,67 and 70 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>1</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 11, 38, 55 and 72 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 11 recites the limitation "wherein the molar ratio of the hydroxide or alkoxide of the alkali metal or alkaline earth metal catalyst..." in line 2 of the claim. There is insufficient antecedent basis for this limitation in the claim. The instant claim depends from claim 1; however, claim 1 broadly recites "an aldol catalyst solution". An alkali metal or alkaline earth metal aldol catalyst is not mentioned until claim 10. It appears that applicants' intent is to have claim 11 depend from claim 10, and if that were the case, the examiner would like to suggest that applicants amend claim 11 accordingly.

Claim 38 recites the limitation "wherein the molar ratio of the hydroxide or alkoxide of the alkali metal or alkaline earth metal catalyst..." in line 2 of the claim. There is insufficient antecedent basis for this limitation in the claim. The instant claim depends from claim 31; however, claim 31 broadly recites "an aldol catalyst solution". An alkali metal or alkaline earth metal aldol catalyst is not mentioned until claim 37. It appears that applicants' intent is to have claim 38 depend from claim 37, and if that

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were the case, the examiner would like to suggest that applicants amend claim 38 accordingly.

Claim 55 recites the limitation "wherein the molar ratio of the hydroxide or alkoxide of the alkali metal or alkaline earth metal catalyst..." in line 2 of the claim. There is insufficient antecedent basis for this limitation in the claim. The instant claim depends from claim 48; however, claim 48 broadly recites "an aldol catalyst solution". An alkali metal or alkaline earth metal aldol catalyst is not mentioned until claim 54. It appears that applicants' intent is to have claim 55 depend from claim 54, and if that were the case, the examiner would like to suggest that applicants amend claim 55 accordingly.

Claim 72 recites the limitation "wherein the molar ratio of the hydroxide or alkoxide of the alkali metal or alkaline earth metal catalyst..." in line 2 of the claim. There is insufficient antecedent basis for this limitation in the claim. The instant claim depends from claim 65; however, claim 65 broadly recites "an aldol catalyst solution". An alkali metal or alkaline earth metal aldol catalyst is not mentioned until claim 71. It appears that applicants' intent is to have claim 72 depend from claim 71, and if that were the case, the examiner would like to suggest that applicants amend claim 72 accordingly.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 5-7, 9-21, and 23-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Muthusamy et al (US 5,583,263) and further in view of Letts (4,739,122).

The instant claims are drawn to a process for producing a higher molecular weight ketone by feeding an aldol catalyst solution, a lower molecular weight aldehyde, and a lower molecular weight ketone, through a reactor provide with a solid hydrogenation catalyst and hydrogen gas, recovering a liquid reactor effluent containing the higher molecular weight ketone, and recycling a portion of the recovered effluent back through the reactor. Further limitations include the aldol catalyst solution being comprised of an alkali metal or alkaline earth metal hydroxide or alkoxide, the residence time of the reaction mixture being from about 2 to 200 minutes, and the hydrogenation catalyst being a shaped or extruded transition metal catalyst supported on a stable support.

Muthusamy et al teach a process for preparing ketones wherein n-butyraldehyde is reacted with dimethyl ketone (acetone) in a cross-aldol reaction to produce methyl n-amyl ketone, as well as other products. The reaction takes place at a temperature between 0 and 60° C, and a temperature between 1 and about 10 atmospheres. Basic catalysts such as lithium, magnesium, sodium and calcium hydroxide or ethoxide are used. An amount of 0.1 to 25 weight percent of the aldehyde is used. Muthusamy et al further teach that after dehydration of the intermediates, the resulting compounds are

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hydrogenated in the presence of a catalyst comprising cobalt, palladium, platinum, copper, chromium, etc., on a support such as alumina, carbon, and silica. It is this hydrogenation that yields the crude methyl n-amyl ketone (col. 5, line 41 to col. 7, line 2). The reaction has a run time of 30 to 120 minutes (table 2 at cols. 9 and 10).

The differences between Muthusamy et al and the present invention is that Muthusamy et al do not *expressly* teach that a portion of the product (reactor effluent) may be recycled back to the reactor; also, Muthusamy et al do not *expressly* teach the specific ratio of aldol catalyst to lower molecular weight aldehyde recited in the present claims.

Letts teaches a similar process wherein a lower molecular weight ketone and a lower molecular weight aldehyde are subjected to a cross-aldol reaction to produce a higher molecular weight ketone, and specifically teaches that un-reacted ketone and aldehyde can be recycled back to the reactor (Example 1, col. 7, lines 11-34).

Therefore, with regard to the first difference, the examiner purports that it would have been obvious to a person of ordinary skill in the art, at the time the present invention was made, to recycle a portion of the reactor effluent from the process taught by Muthusamy et al, back into the reactor, since such a step has already been suggested in the process for making higher molecular weight ketones taught by Lett. A person having ordinary skill in the art would have been motivated to recycle a portion of the reactor effluent in the process taught by Muthusamy et al in order to conduct a more economically efficient process, and to afford higher conversion of the reactants to the higher molecular weight ketone.

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With regard to the second difference, the examiner takes the position that since applicants do not suggest any unexpected or superior results when employing the aldol catalyst in a ratio as recited in the instant claims, the ratio of aldol catalyst to aldehyde reactant recited by applicants would have been obvious to a person of ordinary skill in the art. The examiner's position is predicated on the fact that a person of ordinary skill would be motivated to modify such a ratio in order to find the minimum value that could be employed to *effectively* catalyze the aldol reaction.

Claims 31, 34, 35, 37-42, and 44-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Muthusamy et al (US 5,583,263) and further in view of Lett (4,739,122).

The instant claims are drawn to a method for producing methyl amyl ketone by feeding an aldol catalyst solution, n-butyraldehyde, and acetone, through a reactor provide with a solid hydrogenation catalyst and hydrogen gas, recovering a liquid reactor effluent containing methyl amyl ketone, and recycling a portion of the recovered effluent back through the reactor. Further limitations include the aldol catalyst solution being comprised of an alkali metal or alkaline earth metal hydroxide or alkoxide, the residence time of the reaction mixture being from about 2 to 200 minutes, and the hydrogenation catalyst being a shaped or extruded transition metal catalyst supported on a stable support.

Muthusamy et al teach a process for preparing ketones wherein n-butyraldehyde is reacted with dimethyl ketone (acetone) in a cross-aldol reaction to produce methyl n-

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amyl ketone, as well as other products. The reaction takes place at a temperature between 0 and 60° C, and a temperature between 1 and about 10 atmospheres. Basic catalysts such as lithium, magnesium, sodium and calcium hydroxide or ethoxide are used. An amount of 0.1 to 25 weight percent of the aldehyde is used. Muthusamy et al further teach that after dehydration of the intermediates, the resulting compounds are hydrogenated in the presence of a catalyst comprising cobalt, palladium, platinum, copper, chromium, etc., on a support such as alumina, carbon, and silica. It is this hydrogenation that yields the crude methyl n-amyl ketone (col. 5, line 41 to col. 7, line 2). The reaction has a run time of 30 to 120 minutes (table 2 at cols. 9 and 10).

The differences between Muthusamy et al and the present invention is that Muthusamy et al do not *expressly* teach that a portion of the product (reactor effluent) may be recycled back to the reactor; also, Muthusamy et al do not *expressly* teach the specific ratio of aldol catalyst to lower molecular weight aldehyde recited in the present claims.

Letts teaches a similar process wherein a lower molecular weight ketone, i.e., acetone, and a lower molecular weight aldehyde, i.e., n-butyraldehyde, are subjected to a cross-aldol reaction to produce a higher molecular weight ketone, and specifically teaches that un-reacted ketone and aldehyde can be recycled back to the reactor (Example 1, col. 7, lines 11-34).

Therefore, with regard to the first difference, the examiner purports that it would have been obvious to a person of ordinary skill in the art, at the time the present invention was made, to recycle a portion of the reactor effluent from the process taught



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by Muthusamy et al, back into the reactor, since such a step has already been suggested in the process for making higher molecular weight ketones taught by Lett. A person having ordinary skill in the art would have been motivated to recycle a portion of the reactor effluent in the process taught by Muthusamy et al in order to conduct a more economically efficient process, and to afford higher conversion of the reactants to the higher molecular weight ketone.

With regard to the second difference, the examiner takes the position that since applicants do not suggest any unexpected or superior results when employing the aldol catalyst in a ratio as recited in the instant claims, the ratio of aldol catalyst to aldehyde reactant recited by applicants would have been obvious to a person of ordinary skill in the art. The examiner's position is predicated on the fact that a person of ordinary skill would be motivated to modify such a ratio in order to find the minimum value that could be employed to *effectively* catalyze the aldol reaction.

Claims 48, 51, 52, 54-59, and 61-64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Muthusamy et al (US 5,583,263) and further in view of Letts (US 4,739,122).

The instant claims are drawn to a method for producing methyl iso-amyl ketone by feeding an aldol catalyst solution, i-butyraldehyde, and acetone, through a reactor provide with a solid hydrogenation catalyst and hydrogen gas, recovering a liquid reactor effluent containing methyl iso-amyl ketone, and recycling a portion of the recovered effluent back through the reactor. Further limitations include the aldol

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catalyst solution being comprised of an alkali metal or alkaline earth metal hydroxide or alkoxide, the residence time of the reaction mixture being from about 2 to 200 minutes, and the hydrogenation catalyst being a shaped or extruded transition metal catalyst supported on a stable support.

Muthusamy et al teach a process for preparing ketones wherein n-butyraldehyde is reacted with dimethyl ketone (acetone) in a cross-aldol reaction to produce methyl n-amyl ketone, as well as other products. The reaction takes place at a temperature between 0 and 60° C, and a pressure between 1 and about 10 atmospheres. Basic catalysts such as lithium, magnesium, sodium and calcium hydroxide or ethoxide are used. An amount of 0.1 to 25 weight percent of the aldehyde is used. Muthusamy et al further teach that after dehydration of the intermediates, the resulting compounds are hydrogenated in the presence of a catalyst comprising cobalt, palladium, platinum, copper, chromium, etc., on a support such as alumina, carbon, and silica. It is this hydrogenation that yields the crude methyl n-amyl ketone (col. 5, line 41 to col. 7, line 2). Muthusamy et al also teach that methyl iso-amyl ketone can also be produced by substituting i-butyraldehyde for n-butyraldehyde in the process described therein (col. 7, lines 1-10). The reaction(s) described in the reference has a run time of 30 to 120 minutes (table 2 at cols. 9 and 10).

The differences between Muthusamy et al and the present invention is that Muthusamy et al do not *expressly* teach that a portion of the product (reactor effluent) may be recycled back to the reactor; also, Muthusamy et al do not *expressly* teach the

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specific ratio of aldol catalyst to lower molecular weight aldehyde recited in the present claims.

Letts teaches a similar process wherein a lower molecular weight ketone, i.e., acetone, and a lower molecular weight aldehyde, i.e., n-butyraldehyde, are subjected to a cross-aldol reaction to produce a higher molecular weight ketone, and specifically teaches that un-reacted ketone and aldehyde can be recycled back to the reactor (Example 1, col. 7, lines 11-34).

Therefore, with regard to the first difference, the examiner purports that it would have been obvious to a person of ordinary skill in the art, at the time the present invention was made, to recycle a portion of the reactor effluent from the process taught by Muthusamy et al, back into the reactor, since such a step has already been suggested in the process for making higher molecular weight ketones taught by Lett. A person having ordinary skill in the art would have been motivated to recycle a portion of the reactor effluent in the process taught by Muthusamy et al in order to conduct a more economically efficient process, and to afford higher conversion of the reactants to the higher molecular weight ketone.

With regard to the second difference, the examiner takes the position that since applicants do not suggest any unexpected or superior results when employing the aldol catalyst in a ratio as recited in the instant claims, the ratio of aldol catalyst to aldehyde reactant recited by applicants would have been obvious to a person of ordinary skill in the art. The examiner's position is predicated on the fact that a person of ordinary skill

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would be motivated to modify such a ratio in order to find the minimum value that could be employed to *effectively* catalyze the aldol reaction.

Claims 65, 68, 69, and 71-80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Muthusamy et al (US 5,583,263) and further in view of Letts (US 4,739,122).

The instant claims are drawn to a process for producing methyl propyl ketone by feeding an aldol catalyst solution, acetaldehyde, and acetone, through a reactor provide with a solid hydrogenation catalyst and hydrogen gas, recovering a liquid reactor effluent containing methyl propyl ketone, and recycling a portion of the recovered effluent back through the reactor. Further limitations include the aldol catalyst solution being comprised of an alkali metal or alkaline earth metal hydroxide or alkoxide, the residence time of the reaction mixture being from about 2 to 200 minutes, and the hydrogenation catalyst being a shaped or extruded transition metal catalyst supported on a stable support.

Muthusamy et al teach a process for preparing ketones wherein n-butyraldehyde is reacted with dimethyl ketone (acetone) in a cross-aldol reaction to produce methyl n-amyl ketone, as well as other products. The reaction takes place at a temperature between 0 and 60° C, and a pressure between 1 and about 10 atmospheres. Basic catalysts such as lithium, magnesium, sodium and calcium hydroxide or ethoxide are used. An amount of 0.1 to 25 weight percent of the aldehyde is used. Muthusamy et al further teach that after dehydration of the intermediates, the resulting compounds are

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hydrogenated in the presence of a catalyst comprising cobalt, palladium, platinum, copper, chromium, etc., on a support such as alumina, carbon, and silica. It is this hydrogenation that yields the crude methyl n-amyl ketone (col. 5, line 41 to col. 7, line 2). Muthusamy et al also teach that methyl iso-amyl ketone can also be produced by substituting i-butyraldehyde for n-butyraldehyde in the process described therein (col. 7, lines 1-10). The reaction(s) described in the reference has a run time of 30 to 120 minutes (table 2 at cols. 9 and 10).

The differences between Muthusamy et al and the present invention is that Muthusamy et al do not *expressly* teach that a portion of the product (reactor effluent) may be recycled back to the reactor; also, Muthusamy et al do not *expressly* teach the specific ratio of aldol catalyst to lower molecular weight aldehyde recited in the present claims, and, Muthusamy et al do not specifically teach the production of methyl propyl ketone.

Letts teaches a similar process wherein a lower molecular weight ketone, i.e., acetone, and a lower molecular weight aldehyde, i.e., n-butyraldehyde, formaldehyde, acetaldehyde, or propionaldehyde, are subjected to a cross-aldol reaction to produce a higher molecular weight ketone, and specifically teaches that un-reacted ketone and aldehyde can be recycled back to the reactor (Example 1, col. 7, lines 11-34).

Therefore, with regard to the first difference, the examiner purports that it would have been obvious to a person of ordinary skill in the art, at the time the present invention was made, to recycle a portion of the reactor effluent from the process taught by Muthusamy et al, back into the reactor, since such a step has already been

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suggested in the process for making higher molecular weight ketones taught by Lett. A person having ordinary skill in the art would have been motivated to recycle a portion of the reactor effluent in the process taught by Muthusamy et al in order to conduct a more economically efficient process, and to afford higher conversion of the reactants to the higher molecular weight ketone.

With regard to the second difference, the examiner takes the position that since applicants do not suggest any unexpected or superior results when employing the aldol catalyst in a ratio as recited in the instant claims, the ratio of aldol catalyst to aldehyde reactant recited by applicants would have been obvious to a person of ordinary skill in the art. The examiner's position is predicated on the fact that a person of ordinary skill would be motivated to modify such a ratio in order to find the minimum value that could be employed to *effectively* catalyze the aldol reaction.

With regard to the last difference, the examiner takes the position that although Muthusamy et al do not specifically teach the production of methyl propyl ketone, as claimed by applicants, the instant invention would still have been obvious to a person of ordinary skill in the art. The examiners position is predicated on the fact that Muthusamy et al teach at column 7, lines 3-10, that by substituting i-butyraldehyde for n-butyraldehyde, methyl iso-amyl ketone can be produced, instead of methyl amyl ketone. Furthermore, Lett teaches that aldehydes such as formaldehyde, acetaldehyde, butyraldehyde, etc., can be used as the starting aldehyde. Therefore, it would have been obvious for a person of ordinary skill in the art to substitute the n-butyraldehyde or i-butyraldehyde starting material taught by Muthusamy et al with a different, lower

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molecular weight aldehyde, such as acetaldehyde. A person of ordinary skill would have been motivated to make such a substitution by the desire to produce the corresponding higher molecular weight ketone that would reasonably be expected to be produced by cross-aldol reaction of acetone with the lower molecular weight aldehyde chosen as starting material.

Claims 2-4, 8, 22, 32, 33, 36, 43, 49, 50, 53, 60, 66, 67, and 70 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikarl A. Witherspoon whose telephone number is 571-272-0649. The examiner can normally be reached on M-F 8:30-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Johann Richter can be reached on 571-272-0646. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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*Sikarl A. Witherspoon* 8/04/04

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